

SPIONIDAE (ANNELIDA: POLYCHAETA) FROM THE GALÁPAGOS RIFT GEOTHERMAL VENTS

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Abstract.—Three new species of spionid polychaetes have been collected from biological communities associated with geothermal vents along the Galápagos Rift. Each species belongs to a separate genus, 2 of which are new. *Xandaros acanthodes*, new genus and species, has branchial and neurosetal features unique to the family. A new genus, *Laubieriellus*, is erected for *L. grasslei*, new species, and *Prionospio salzi* Laubier, 1970. A new species, *Prionospio (Minuspio) sandersi*, is also described from vent communities. Samples taken as part of a study of the infaunal diversity in sediments near vent areas contained *Aurospio dibranchiata* Maciolek, 1981, recently described from several Atlantic locations. This is the first Pacific record for *A. dibranchiata*.

The discovery of unique biological communities associated with geothermal vents along the Galápagos Rift has led to several studies of the animals found in these assemblages (Grassle *et al.*, 1979). Recently, Jones (1981) described *Riftia pachyptila*, the large vestimentiferan which dominates several of these vent communities. Dr. Howard L. Sanders of the Woods Hole Oceanographic Institution found many small polychaetes associated with *Riftia*, as well as with other vent species such as the large mussels and clams. These organisms were brought on board ship and were held for a time in containers of natural or artificial seawater. This water was later passed through fine-meshed screens to retain the smaller epifaunal organisms. Additional epifaunal polychaetes were found on slate fouling panels placed near active vents by Drs. Ruth Turner of Harvard University and Carl J. Berg of the Marine Biological Laboratory, Woods Hole.

A study by Dr. J. Frederick Grassle (WHOI) of the macrofaunal diversity in sediments peripheral to the vents yielded several infaunal species of polychaetes.

Polychaetes from the above studies include 3 new species belonging to the family Spionidae. A new genus and species, *Xandaros acanthodes*, is an epifaunal species associated with the mussels and *Riftia pachyptila*. A new genus, *Laubieriellus*, is erected to include a new species, *L. grasslei*, found both in association with the larger organisms and on the slate fouling panels placed near the vents. The third new species, *Prionospio (Minuspio)*

sandersi, is represented by a single specimen found in association with *R. pachyptila*. These genera and species are described below. An additional species, *Aurospio dibranchiata*, recently described from several locations in the Atlantic Ocean (Maciolek, 1981), was found in the sediment samples.

Holotypes and paratypes have been deposited in the National Museum of Natural History, Smithsonian Institution (USNM), Washington, D.C. Additional specimens have been retained by Drs. H. L. Sanders (HLS) and J. F. Grassle (JFG) at the Woods Hole Oceanographic Institution and by Drs. R. D. Turner and C. J. Berg (CJB) at the Marine Biological Laboratory, Woods Hole.

Xandaros, new genus

Type-species.—*Xandaros acanthodes*, new species. Gender, masculine.

Diagnosis.—Prostomium anteriorly rounded, without posterior keel, lacking eyes and occipital tentacle. Peristomium well-developed, partly fused to setiger 1, not elaborated into wings or hood. Palps inserted at anterior dorsal junction of prostomium and peristomium. Setiger 1 lacking notopodial lamellae and setae, neuropodial lamellae bilobed, with capillary setae. Branchiae beginning on setiger 4, continuing for several setigers; elongate, cylindrical, with wrinkled appearance. No interramal or interparapodial pouches. Notopodial setae all capillaries. Neuropodial capillaries of setigers 1 and 2 mostly replaced by unhooded, recurved acicular spines from setiger 3, these spines grading into bidentate hooded hooks by middle of body and continuing to last setiger; ventral sabre setae lacking. Pygidium with 4 unequal lobes.

Remarks.—*Xandaros* is a unique spionid in several respects. Modified setae are present in the neuropodia from setiger 3, and the intergradational change of these setae from unhooded acicular spines to recurved, bidentate hooded hooks is singular in the family. *Scolecopides* spp. have ventral acicular spines in some anterior setigers, but these do not grade into hooded hooks. *Pygospio dubia* has similar spines, but these are found in place of hooded hooks in posterior setigers. The neuropodial hooded hooks found in *Xandaros* are somewhat similar to, but not identical with, the half-hooded hooks in several species of *Spiophanes*. In that genus, the hoods extend only from the tip of the main tooth to the shaft beneath, leaving the apical tooth and entire distal part of the hook open. In *Xandaros*, the hoods do not extend completely over the apical tooth, but do extend beyond the distal part of the hook, thus being somewhat larger than those in *Spiophanes*. *Xandaros* is also unusual in having branchiae from setiger 4, rather than from setiger 1 or 2, as is typical for most spionid genera. The presence of branchiae from setiger 4 and acicular neurosetae also suggest a close relationship to the family Paraonidae. The presence of dorsal palps and hooded

hooks, however, clearly allies this genus with the Spionidae. A single species is known.

Etymology.—*Xandaros* (Greek), a fabulous sea-creature.

Xandaros acanthodes, new species

Figs. 1, 2

Material examined.—GALÁPAGOS RIFT geothermal vents. "Garden of Eden," 0°47.7'N, 86°7.7'W, 2482 m, *Alvin* Dive 884, 25 January 1979, mussel washings, 11 paratypes (USNM 65924). "Rose Garden," 0°48.3'N, 86°13.5'W, 2447 m, *Alvin* Dive 984, 1 December 1979, mussel washings, holotype (USNM 65922) and 22 paratypes (USNM 65923). *Alvin* Dive 990, 7 December 1979, washings from *Riftia pachyptila*, #14, 1 paratype (USNM 65925), #41, 6 paratypes (USNM 65926).

Description.—Small species, 0.3 mm wide and 6 mm long for approximately 55 setigers. Color in alcohol white. Anterior region of body flattened, more cylindrical posteriorly. Prostomium rounded anteriorly, ending indistinctly at anterior margin of setiger 1 (Fig. 1A); no occipital tentacle or eyes. Peristomium distinct ventrally and laterally, fused dorsally with setiger 1, not developed into wings or hood (Fig. 1A, B). Palps short, thick, inserted dorsally at anterior junction of prostomium and peristomium (Fig. 1A, B). Setiger 1 lacking notopodial lobes and setae (Fig. 1B). Notopodial lobes digitiform, poorly developed in anterior setigers (Fig. 2A, B), reduced to small globular prominences in posterior setigers (Fig. 2C). Neuropodial lamellae bilobed in setiger 1 (Fig. 1B), rounded in anterior setigers (Fig. 2A), reduced posteriorly to oval ventral elongations (Fig. 2B, C). Branchiae from setiger 4 (Fig. 1A, B), continuing to setigers 10–13; branchiae inserted on bases of parapodia (Fig. 1A), free from dorsal lamellae; branchiae elongate, wrinkled in appearance except for smooth, rounded tip, heavily ciliated for most of length excluding tip (Fig. 1C, D); posterior pairs shorter than anterior pairs. Notopodial setae all capillaries, clear, lacking granulations, similar along length of body, numbering up to 10 per fascicle, arranged in single row. Neuropodial setae changing along length of body; capillaries of setigers 1 and 2 mostly replaced on setigers 3–10 with recurved, unhooded acicular spines (Fig. 2D, F), these spines becoming thinner and straighter in setigers 11–15 (Fig. 2G), then replaced by bidentate hooks with half-hoods (Fig. 2H, I) from setiger 16 to end of body; spines and hooded hooks accompanied by 4–5 large (Fig. 2D) and 2–3 short, thin (Fig. 2E) capillaries throughout. Pygidium with 2 dorsal and 2 larger ventral lobes (Fig. 1E, F).

Etymology.—*akanthus* (Greek), thorn; *-odes* (Greek), suffix meaning like; *acanthodes*, thorny. The specific name refers to the presence of spine-like setae in several setigers.

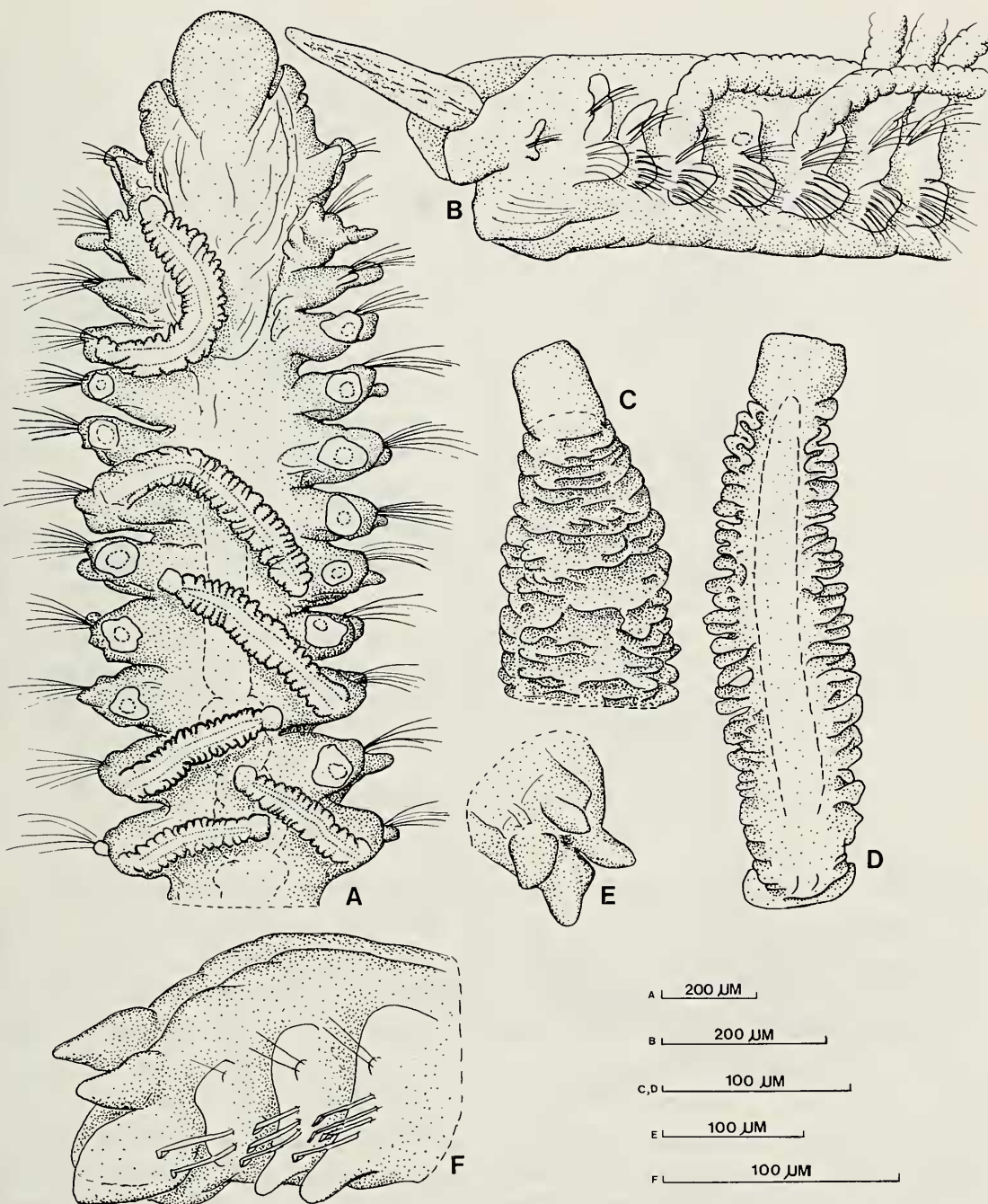


Fig. 1. *Xandaros acanthodes*: A, Anterior end, dorsal view, palps and several branchiae removed; B, Anterior end, lateral view; C, Distal tip of branchia in lateral view; D, Entire branchia, dorsal view; E, Pygidium, posterior view; F, Pygidium and last 3 setigers, lateral view.

Laubieriellus, new genus

Type-species.—*Laubieriellus grasslei*, new species. Gender, masculine.

Diagnosis.—Prostomium anteriorly rounded, or with slight medial incision, prolonged posteriorly as a keel, lacking occipital tentacle. Peristomium

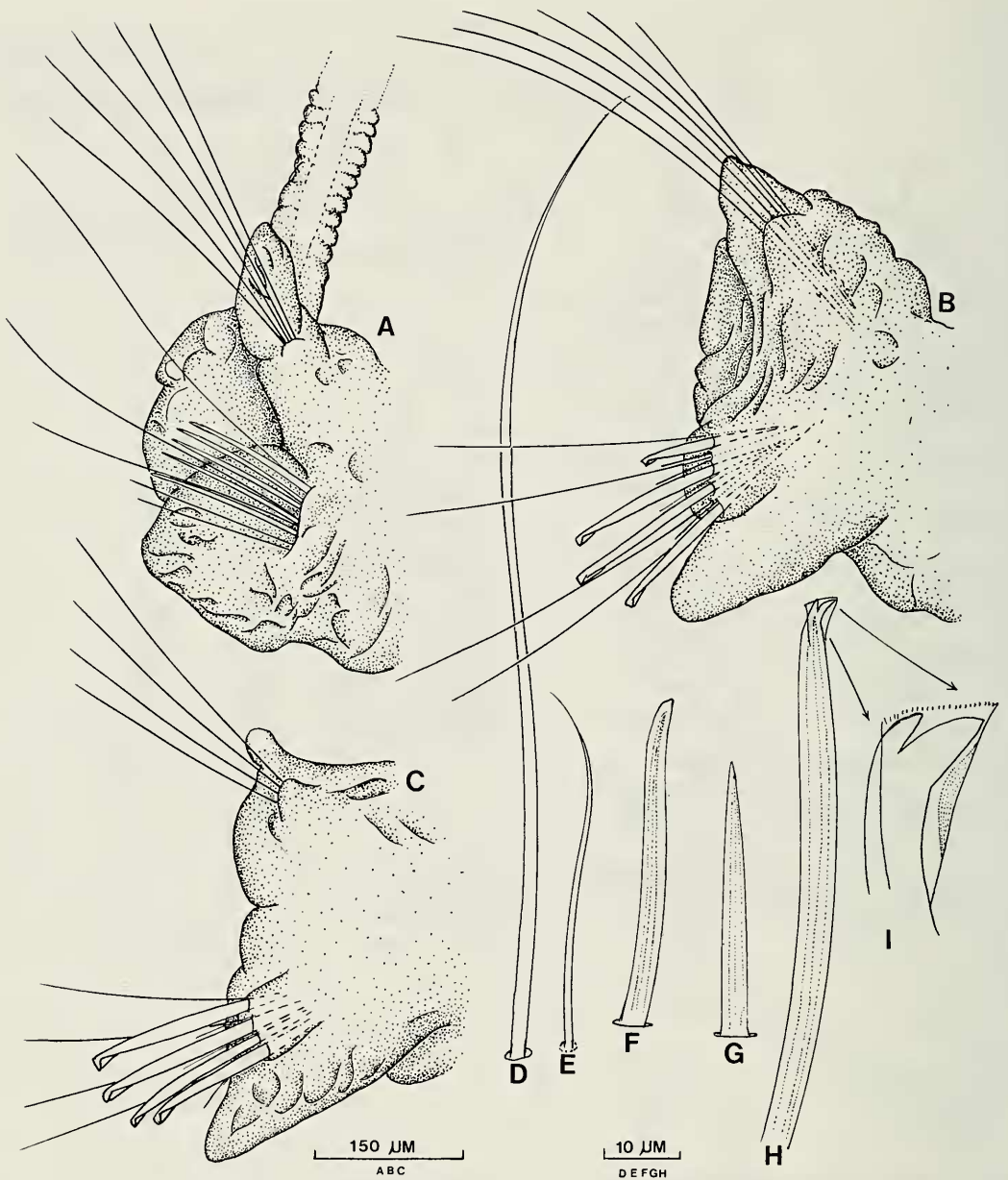


Fig. 2. *Xandaros acanthodes*: A, Setiger 13, anterolateral view; B, Setiger 27, anterior view; C, Setiger 34, anterior view; D, Capillary seta from setiger 28; E, Short capillary seta from setiger 7; F, Recurved neuropodial spine from setiger 10; G, Straight neuropodial spine from setiger 14; H, Bidentate hooded hook; I, Detail of hooded hook (not to scale).

only partly fused with, and therefore fairly distinct from, setiger 1. Branchiae numbering 4 pairs from setiger 2; each gill elongate, cylindrical, smooth, distinct from notopodial lamella. Neuropodial presetal lamellae connected in ventral crests on several anterior setigers from setiger 2. Notopodial postsetal lamellae connected in dorsal crests on several postbranchial setigers. Anterior setae all capillaries, multidentate hooded hooks in posterior neuropodia, notopodial hooks lacking. Pygidium with 2 short ventrolateral lobes and 1 longer dorsomedial cirrus, or 3 subequal lobes.

Remarks.—*Laubieriellus* is established to include 2 species: the type-species, *L. grasslei*, described below, and *Prionospio salzi* Laubier, 1970, described from the Mediterranean coast of Israel. The lack of notopodial hooded hooks is considered to be a taxonomic character of sufficient weight to warrant separation of these species from the genus *Prionospio*, which has notopodial hooks. The occurrence of ventral crests in both species is also a unique characteristic of this genus.

In describing *Prionospio salzi*, Laubier (1970) explained the lack of notopodial hooks by concluding that the specimens represented "old larvae." However, the holotype (USNM 42621) of *P. salzi* does not appear to be a larval form; on the contrary, it lacks larval setal types, and has a prostomium which is elongated into a posterior keel, which larval forms lack (Hannerz, 1956). Laubier (1970) described the anterior end of his species as underdeveloped, with a very reduced prostomium and poorly developed peristomium. The holotype does indeed appear to have an anteriorly reduced prostomium, as Laubier has figured; however, the peristomium appears to be well-developed.

Etymology.—This genus is named for Dr. Lucien Laubier of the Centre Océanologique de Bretagne, who recognized the unique characteristics of *P. salzi*, and who has contributed greatly to polychaete systematics.

Laubieriellus grasslei, new species

Figs. 3, 4

Material examined.—GALÁPAGOS RIFT geothermal vents. "Rose Garden," 0°48.2'N, 86°13.5'W, 2447 m, *Alvin* Dive 984, 1 December 1979, washings from slate fouling panels, holotype (USNM 65913), 20 paratypes (USNM 65914), 13 additional specimens (CJB). *Alvin* Dive 890, 15 February 1979, 3 specimens (USNM 65920). *Alvin* Dive 894, 19 February 1979, collected in amphipod trap, 21 paratypes (USNM 65916). *Alvin* Dive 984, 1 December 1979, 2 specimens (HLS). *Alvin* Dive 990, 7 December 1979, washings from *Riftia pachyptila*, 3 specimens (HLS). "Mussel Bed," 0°47.9'N, 86°9.2'W, 2493 m, *Alvin* Dive 879, 20 January 1979, washings from mussels, 9 specimens (USNM 65918). *Alvin* Dive 880, 21 January 1979, washings from mussels, 3 specimens (USNM 65919). *Alvin* Dive 985, 20 February 1979, 3 paratypes (USNM 65917). *Alvin* Dive 989, 6 December 1979, 8 specimens (HLS). "Garden of Eden," 0°47.7'N, 86°7.7'W, 2482 m, *Alvin* Dive 884, 25 January 1979, washings from mussels, 4 paratypes (USNM 65915). *Alvin* Dive 891, 16 February 1979, 15 specimens (HLS). *Alvin* Dive 993, 10 December 1979, 2518 m, crab trap washings #7, 1 specimen (HLS).

Description.—Small species, measuring up to 0.75 mm wide and 11.5 mm long for 43 setigers. Color in alcohol yellowish white. Prostomium broadly rounded on anterior margin, occasionally with slight medial incision (Fig.

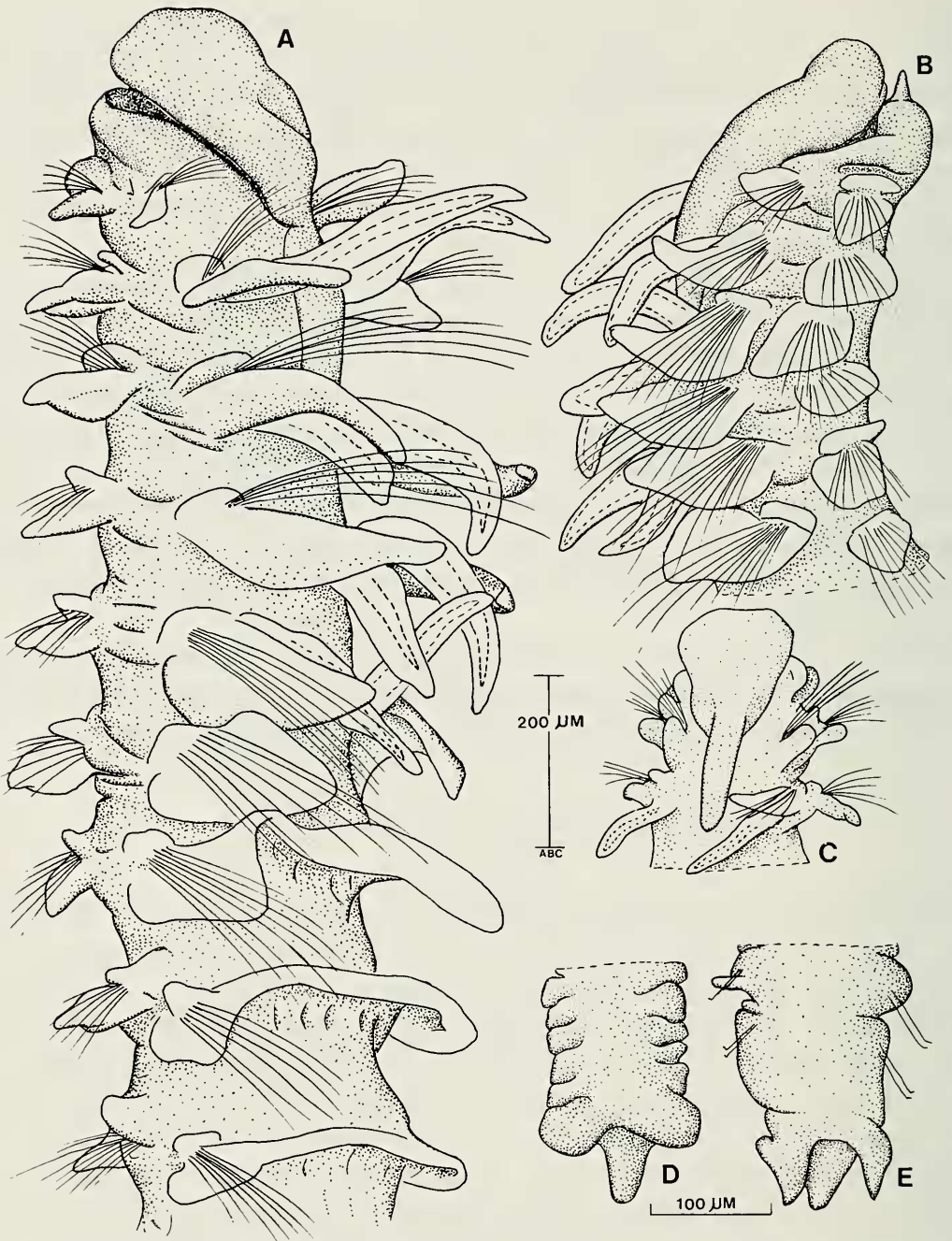


Fig. 3. *Laubieriellus grasslei*: A, Anterior end, dorsolateral view; B, Anterior end, lateral view; C, Anterior end, dorsal view; D, E, Pygidium, ventral view.

3A–C), inflated in mid-region, extending as narrow keel to base of setiger 2 in smaller specimens (Fig. 3C) or setiger 3 in larger specimens (Fig. 3A, B); lacking eyes or occipital tentacle (Fig. 3A–C). Palps inserted dorsally at posterior junction of prostomium and peristomium. Peristomium mostly distinct from setiger 1, widely separated ventrally and laterally, with thin membranous connection dorsally forming presetal lobe of notopodium on

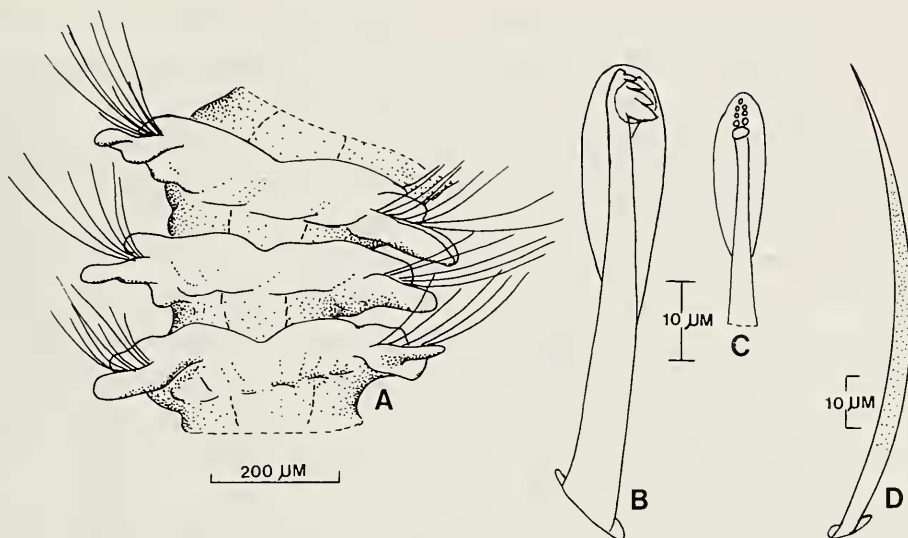


Fig. 4. *Laubieriellus grasslei*: A, Setigers 5–7, ventral view, showing crests formed by presetal neuropodial lamellae; B, C, Neuropodial hooded hook; D, Ventral sabre seta.

setiger 1, not developed into wings or hood (Fig. 3A–C). Setiger 1 with well-developed notopodial and neuropodial lamellae, both rounded, smaller than on following setigers (Fig. 3B). Notopodial lamellae of branchial region with medial edge elongated over dorsum; connected in large dorsal crests on setigers 7, 8 and 9 (Fig. 3A), and low dorsal ridges on setigers 10–12; lamellae reduced to small digitiform lobes in posterior setigers. Neuropodial lamellae rounded throughout, largest in branchial region (Fig. 3B), reduced thereafter, becoming low ridges in posterior setigers; presetal lamellae connected in ventral crests from setiger 2, these crests largest on setigers 6–11 (Fig. 4A). Branchiae numbering 4 pairs, on setigers 2–5; each gill smooth, elongate, heavily ciliated, equal in length or pair 1 slightly longer (Fig. 3A). Anterior setae all capillaries, arranged in 2 rows, with anterior row shorter than posterior row; setal numbers reduced in posterior setigers to 6–10 in notopodium, 1–3 in neuropodium; each seta striated, lightly granulated, with narrow, clear sheath. Neuropodial multidentate hooded hooks from setiger 10, numbering up to 7 per fascicle; hooks with 3 pairs of apical teeth above main tooth, surmounted by single apical tooth (Fig. 4B, C), with inconspicuous secondary hood (Fig. 4B); notopodial hooks lacking. Ventral sabre setae from setiger 10–11, usually 2, rarely 1, per fascicle; each moderately granulated, with narrow sheath (Fig. 4D). Pygidium with 2 short, rounded, ventrolateral lobes and 1 slightly longer, thinner, dorsomedial cirrus (Fig. 3D), or 3 subequal lobes (Fig. 3E).

Remarks.—*Laubieriellus grasslei* is closely related to *L. salzi* (Laubier), with which it shares the generic characteristics of anterior ventral crests and the lack of notopodial hooded hooks. The 2 species are also similar in

having neuropodial hooks from setiger 10 and in the shape of the pygidium (see below). *L. grasslei* differs from *L. salzi* in having a much larger prostomium, a more widely separated peristomium and setiger 1, 7 rather than 4 small teeth on the hooded hooks, and the presence of dorsal crests on setigers 7, 8, and 9 rather than on setigers 8, 9, and 10 as in *L. salzi*. The dorsal crests are higher and more elaborate in *L. grasslei* than in *L. salzi*.

The pygidial shape of *L. grasslei* varies somewhat, from 3 subequal lobes to 2 short lobes and 1 longer cirrus. The largest specimen examined was mature, with oocytes in the coelom; therefore, its pygidium (Fig. 3D) is considered to be that of the adult of the species. The variability observed in smaller specimens may be due to growth. The pygidium of *L. salzi* has 2 short lateral lobes and 1 slightly longer medial cirrus, similar to that of the mature *L. grasslei*.

Laubieriellus grasslei is a common species in the Galápagos Rift geothermal vent communities, and appears to be opportunistic in nature, occurring in association with several other species, including the vestimentiferan, *Riftia pachyptila*, and the large mussel (as yet unnamed), as well as on the slate fouling panels placed near the vents.

Etymology.—This species is named in honor of Dr. J. Frederick Grassle of the Woods Hole Oceanographic Institution, in recognition and appreciation of his enthusiastic commitment to research of the highest quality.

Prionospio (Minuspio) sandersi, new species

Fig. 5

Material examined.—GALÁPAGOS RIFT geothermal vents. "Rose Garden," 0°48.2'N, 86°13.5'W, 2447 m, *Alvin* Dive 983, 30 November 1979, washings #30 from *Riftia pachyptila*, holotype (USNM 65921).

Description.—Holotype complete with 33 setigers, measuring 0.5 mm wide and 3.2 mm long. Color in alcohol white with bright golden pigment on dorsal edge of setiger 1 (Fig. 5B). Prostomium broadly rounded on anterior margin, narrowing posteriorly, ending at base of setiger 1 (Fig. 5A, B); eyes lacking. Peristomium distinct ventrally and laterally, fused with setiger 1 dorsally, not developed into wings or hood (Fig. 5A); palps inserted dorsally at posterior junction of prostomium and peristomium. Noto- and neuropodial lamellae of setiger 1 well-developed, but smaller than in following setigers (Fig. 5A); notopodial lamellae oval with slightly acuminate tips; neuropodial lamellae smaller, rounded (Fig. 5A). Lamellae of subsequent setigers largest in branchial region; notopodial lamellae broadly oval with medial edge elongated over dorsum in setigers 2–5, with tips somewhat tapered thereafter; lamellae reduced in posterior setigers but retaining small acuminate tip throughout; dorsal ridges or crests lacking (Fig. 5A); neuropodial lamellae rounded throughout, reduced in posterior setigers. Bran-

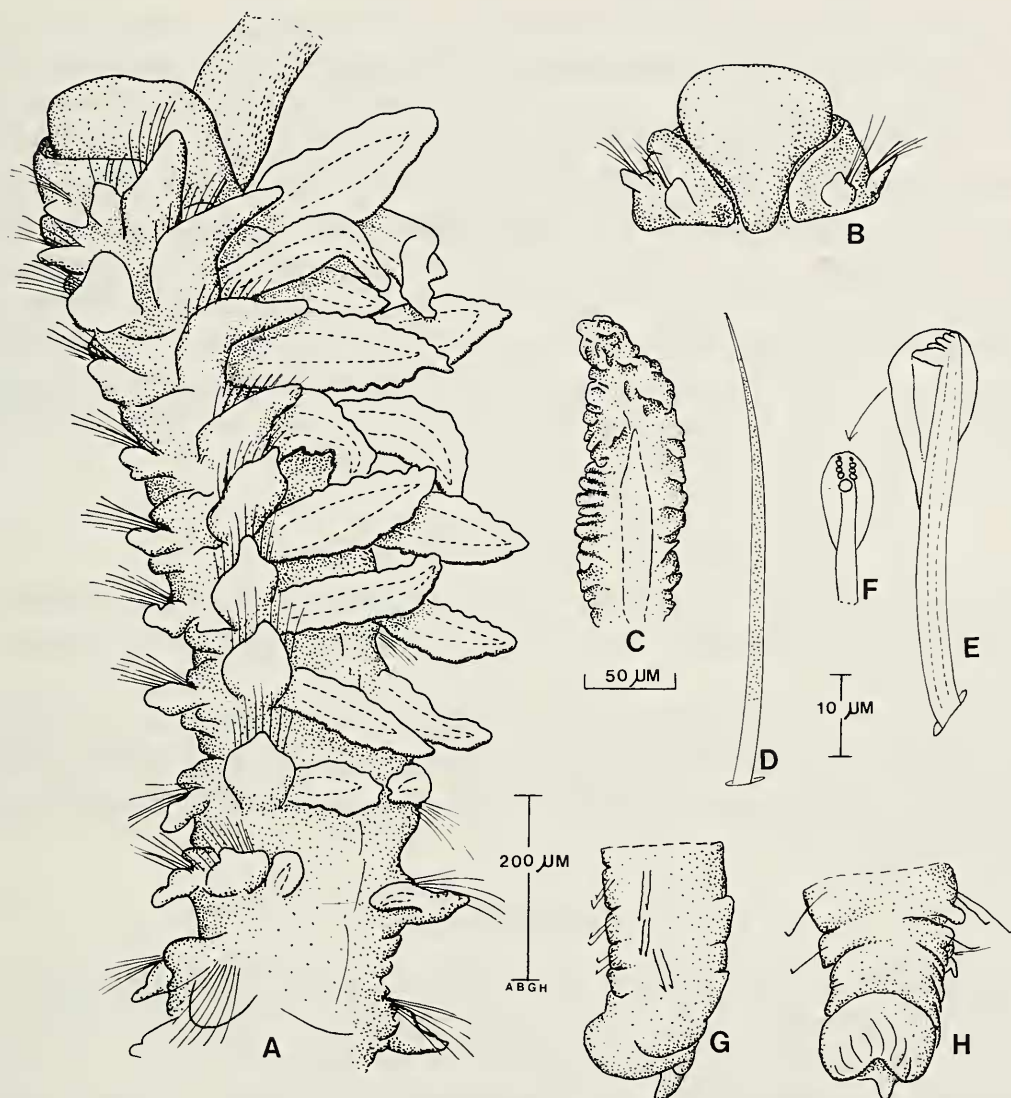


Fig. 5. *Prionospio (Minuspio) sandersi*: A, Anterior end, dorsolateral view; B, Prostomium, dorsal view; C, Branchia, dorsal view, showing details of wrinkled surface; D, Ventral sabre seta; E, F, Hooded hook; G, Pygidium, lateral view; H, Pygidium, ventral view.

chiaie numbering 9 pairs, on setigers 2–10; each gill wide, robust, lacking digitiform pinnules but appearing wrinkled (Fig. 5A, C); largest gill on setiger 4, smaller thereafter, short and stubby on setiger 9, smaller than dorsal lamellae on setiger 10 (Fig. 5A). Anterior setae all capillaries, narrow, not heavily granulate. Multidentate hooded hooks in neuropodia from setiger 15, in notopodia from setiger 29; hooks with 4 pairs of small teeth above main tooth, with secondary hood (Fig. 5E, F); numbering up to 3–4 per neuropodial fascicle, up to 1–2 per notopodial fascicle. Ventral sabre setae from setiger 14; 1 per neuropodium (Fig. 5D). Pygidium cup-shaped, with deeply rounded ventral edge and small dorsal elongation (Fig. 5G, H).

Remarks.—The shape of the pygidium of *P. sandersi* is unusual for an adult *Prionospio*. The structure suggests the typical arrangement (2 short lateral lobes, 1 long medial cirrus) of the *Prionospio* pygidium in that the dorsal elongation represents the long medial cirrus, and the rounded ventral portion represents a fusion of the 2 ventrolateral cirri. This is similar to the form seen in juvenile *Prionospio* (Blake, pers. comm.), and it is possible that the holotype is not a fully developed adult. However, the presence of wide, wrinkled-appearing branchiae readily separates this species from other *Prionospio* (*Minuspio*) species.

Etymology.—This species is named in honor of Dr. Howard L. Sanders of the Woods Hole Oceanographic Institution, whose commitment to science of the highest quality is a continual inspiration.

Aurospio dibranchiata Maciolek, 1981

Material examined.—Gilliss Sta. 301, 18 February 1979, 0°35'N, 86°05'W, 20 km south of "Mounds" area, 2730 m, infaunal box core samples, 9 specimens (JFG).

Remarks.—The specimens from the Pacific are identical in all morphological characters with the Atlantic specimens described by Maciolek (1981). Branchiae are present on setigers 3 and 4, and neuropodial hooded hooks start on setiger 10.

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